

A CASE OF RUPTURE OF THE BICEPS BRACHII AND BRACHIALIS MUSCLES BY DIRECT VIOLENCE.

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A Msutu, male, aged 28, and a labourer, was admitted to the Non-European Hospital, under the care of Mr. McGregor, on 18/2/35, at 10.35 a.m., complaining of injury to the left arm.

History of Present Condition.

At 10 a.m. that morning he was helping to demolish a building, when the wall descended upon him. He stepped aside, and the wall hit him on the left upper arm. He sustained *no open wound* on the arm, but noticed that a swelling appeared immediately. The arm was intensely painful, and he had to support it with his sound limb. He could move his arm, but all movements at the elbow were exceedingly painful. Movements of the wrist and fingers were free and painless. He was

brought to hospital and admitted, a provisional diagnosis of fractured humerus having been made by the Casualty Officer.

Past History.

The patient gave no history of any previous trouble with his arm. Prior to the accident he had never had pain in the arm, which had always been very strong.

Condition on Examination.

The patient was a well-built adult male, lying prone in bed, supporting his injured arm with his opposite hand. The elbow of the injured limb was flexed and the forearm pronated.

There were two small skin abrasions on the anterior aspect of the middle of the upper arm, and a distinct swelling over the anterior aspect of the lower third of the humerus, with a definite depression proximal to the swelling (see Fig. 1.)

Movements at the wrist and fingers were unimpaired. He could flex and extend his elbow and pronate and supinate the forearm

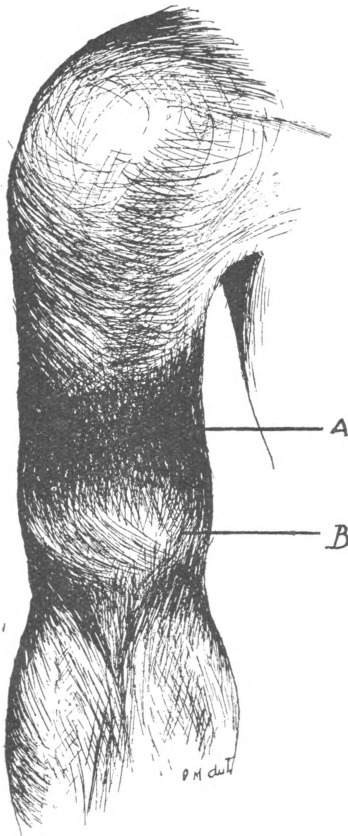


Figure 1.

A.—Groove Above Swelling.
B.—Swelling.

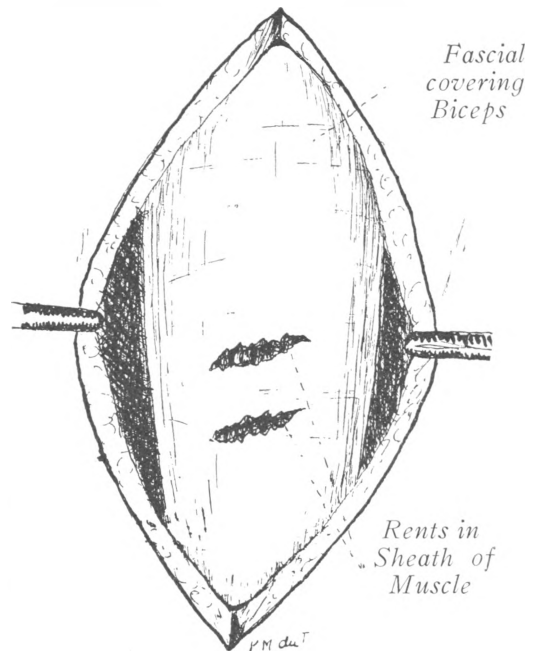


Figure 2.

with difficulty, and all these movements caused intense pain. The movements of his shoulder joint were full but painful.

On palpation the swelling with the groove above could be felt, the groove becoming more marked when the forearm was supinated. The swelling became firmer during supination.

After the examination the arm became so painful that morphia gr. $\frac{1}{4}$ had to be administered.

On the above findings the diagnosis of rupture of the biceps brachii was made, and it was decided to operate the following morning.

At Operation.

(Twenty-two hours after the accident two tears were found in the sheath covering the biceps muscle. (See Fig. 2).

Inside the sheath was a large haematoma. The belly of the biceps was found to have ruptured transversely, except for a few bundles of fibres medially which had remained intact. The musculo-cutaneous nerve was completely severed. The brachialis had also been ruptured completely in the transverse direction, exposing about one inch of the humerus beneath. (See Fig. 3.)

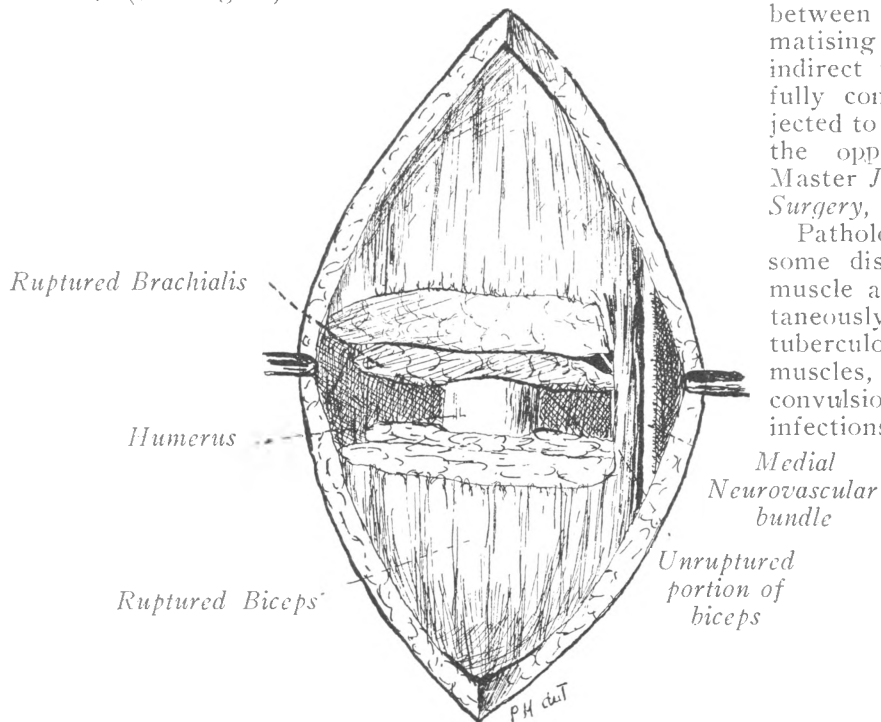


Figure 3.

The ruptured muscles were sutured, as was the biceps sheath, and the wound was closed, without drainage, the limb being supported by a splint in right angled flexion.

Discussion

An interesting point about this case is that in spite of almost complete rupture of the biceps and brachialis, the patient was able to

flex his arm. This flexion was probably accomplished by the action of the brachioradialis and the pronator teres, assisted by the other members of the flexor group of the forearm, which take origin from the medial epicondyle of the humerus. It is doubtful whether a European with the same injuries would have flexed his arm.

Perhaps before proceeding with the discussion of the above case a short classification of muscle ruptures (according to Jokl) would be useful. He classifies ruptures as follows:

1. True ruptures.
 - A. In normal muscles
 - (1) By direct violence (rare).
 - (2) By indirect violence.
 - B. Pathological rupture.
2. False ruptures occurring in sport.

Rupture of a normal muscle by direct violence occurs when the muscle is caught between the bone and the traumatising agent. It occurs by indirect violence, when a forcefully contracted muscle is subjected to a severe passive force in the opposite direction. (MacMaster *Journal of Bone and Joint Surgery*, Feb., 1933).

Pathological rupture is due to some diseased condition of the muscle and usually occurs spontaneously. It may occur in tuberculosis, syphilis, tumours of muscles, trichiniasis, in tetanic convulsions and also in general infections. This type of muscle

rupture is not as rare as might be supposed. Abrahams (*Lancet* 1919) records twenty cases of spontaneous rupture of the rectus abdominis muscle, which occurred during the influenza epidemic of 1918-1919, due to pneumococcal

and streptococcal influenzal septicaemia, and Culbertson (*Journal American Medical Association*, 1925) reports the occurrence of rupture of the rectus abdominis in pregnancy. In his article he calls attention to the susceptibility of this muscle, weakened by pregnancy, to subsequent spontaneous rupture.

Re the "muscle ruptures" occurring in sport, these are believed not to be muscle

ruptures at all, but as none of these cases have ever been operated on, the actual anatomy and pathology of these injuries is not known. (Jokl and Guttman, *Klinische Wochenschrift*, April, 1933.) The following points may be useful in distinguishing true muscle ruptures from those occurring in sport.

TRUE MUSCLE RUPTURES.	"RUPTURES" IN SPORT.
1. Injury is of severe type, often accompanied by collapse, etc.	Injury is only slight, no constitutional disturbances.
2. A break in the continuity of the muscle is usually visible or palpable.	No break in the continuity of the muscle can be observed.
3. Injury is nearly always unilateral.	The condition is very frequently bilateral.
4. May occur anywhere.	Occurs usually in one of 3 muscles. (1) Rectus femoris. (2) Biceps femoris. (3) Gastrocnemius
5. Recovery is slow.	Recovery is rapid.
6. Treatment - operative.	Treatment - application of heat. Operation is never necessary.

This classification shows that only a small proportion of all so-called muscle ruptures are due to direct violence acting on a normal muscle.

Consultation of the current literature reveals that from 1722 - 1925 only 81 cases of ruptured biceps belly had been recorded. (Gillcreest, *Journal of the American Medical Association*, 1925.) There appears to be much doubt regarding the frequency with which ruptures of the biceps occur at the belly, as compared to ruptures in other parts. In his article written in 1925 Gillcreest says, "The site of rupture (of the biceps) may be at any of four points, namely in the muscle substance itself, at the junction of muscle and tendon, or at the origin or insertion of the tendon to bone. According to most writers about 66% are believed to occur in the muscle substance. This estimate can only be theoretical, as so few cases have come to operation. Leers believes that 43.6% or about half occur at the junction of the muscle and the tendon of the long head, 21.8% partial of muscle, 15.1% total of muscle, 19.5% long head." Yet out of a series of 100 cases of ruptured biceps recorded by the same writer in 1934 (Gillcreest, *Journal of Surgery, Gynaecology and Obstetrics*, 1934), only in seven was the muscle belly torn, partly in six instances, completely in one. However the consensus of opinion appears to be, that rup-

ture of the muscle itself is comparatively rare and that rupture, if it does occur, usually takes place at the musculo-tendinous junction. This is explained by the fact that in indirect trauma (to which most muscle ruptures are due) the entire muscle tendon unit from origin to insertion, is subjected to a severe strain, which puts the strength of the different parts to test, and the weakest part is, of course, the first to tear. The weakest part of this system is the musculo-tendinous junction, hence this is the position where rupture most often occurs.

As stated above, muscle rupture is as a rule due to indirect violence. "Direct violence may cause muscle rupture, but according to Lexner this is rare, when compared to indirect violence with rupture of the contracted muscle." (MacMaster, *Journal of Bone and Joint Surgery*, Feb. 1933). In his article MacMaster records the following cases of muscle rupture (at the belly) by direct violence.

1. Female, aged 22, sustained almost complete rupture of rectus femoris belly following direct trauma to the leg in a motorcar accident.
2. Male, aged 30, received severe direct injury from iron pulley to right forearm, causing nearly complete rupture of the flexor carpi radialis muscle.

Montgomery (*Surg. Clin. of Chicago*, 1920) reports a case of ruptured triceps muscle belly following a severe blow on the muscle. Here a truck backed into a man, who attempted to ward it off, but the truck caught his arm, causing rupture of the triceps muscle.

Two more cases of rupture of a muscle belly by direct violence are recorded by Gillcreest (*Journal of the American Medical Association*, 1925). These were in two cavalry officers, who while riding, the saddle being gripped by the action of the adductors, were holding their adductor muscles in adduction. As the horse jumped, the riders' thighs were thrown against the pommel of the saddle. In one case the adductor longus was ruptured, in the other the adductor brevis.

Here, of course, the fact that the muscles were in strong contraction comes into play. According to Gillcreest, muscle ruptures always occur, when the muscle is in strong contraction and a group of antagonistic muscles comes into play.

The above examples prove, that it is possible for muscles to rupture by direct violence, when there is no pathological condition in the muscle. Degenerative processes and diseased

conditions, however, predispose to their rupture, as do cold and over-fatigue.

In the case here reported, no previous diseased process could be traced. Whether other cases of rupture of the biceps brachii by direct violence have been recorded, I do not know. Unfortunately in the 81 cases of ruptured biceps collected by Gillcreest no mention is made as to whether they were caused by direct or indirect violence. Of the 100 cases of biceps injury analysed by Gillcreest in 1934, 17 were caused by direct injury, but whether any of these injuries by direct violence were ruptures of the muscle belly is not stated.

It would therefore appear, that rupture of the biceps belly by direct violence is a very rare condition, but even rarer than this is rupture of the brachialis. Of all the cases of muscle rupture, which have been reported, I cannot in the whole literature find a single case of rupture of the brachialis muscle, either through direct or indirect violence.

Of course, the above statistics cannot be taken as absolutely accurate, firstly because much of the literature on the subject is not

available here, and secondly because, as all writers stress, probably a great number of partial ruptures of muscles are not diagnosed as such, but are diagnosed and treated as sprains.

Prognosis

In the case quoted above, the prognosis was given as good, for although the lower part of the muscle would fibrose, due to its nerve supply having been cut off, by the severing of the musculo-cutaneous nerve, the nerve supply of the upper part had remained intact and when healing of the muscle occurred, the functional result would therefore be good, in spite of fibrosis of the lower part of the muscle.

This favourable prognosis proved correct. When I last saw the patient (14 days after the operation) he could flex his elbow joint fully, and pronate and supinate his forearm, without the least pain or difficulty.

I wish to thank Mr. A. Lee McGregor for permitting me to report on this case and for his kind assistance and criticism in the writing of this article. I also wish to thank Miss M. du Toit, for the accompanying sketches.

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